Surgical Approach to Incontinence

Guest Editor

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Pubovaginal Fascial Sling for the Treatment of all Types of Stress Urinary Incontinence: Surgical Technique and Long-term Outcome

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KEYWORDS

- Burch colposuspension pubovaginal sling
- Autologous rectus fascial slilng
- Simplified urinary incontinence outcome score (SUIOS)

A plethora of surgical techniques has been devised for the treatment of stress urinary incontinence, but over the past decade, two approaches have emerged as the gold standards—the Burch colposuspension and the pubovaginal sling. Historically, use of the pubovaginal sling had been reserved for women with complicated, severe, or recurrent sphincteric incontinence, but has been advocated for almost all types of sphincteric incontinence (simple and complicated). Fueled by a stampede of commercial innovations in sling materials, allograft and synthetic slings have become the most commonly used techniques for treating sphincteric incontinence in women. There is little doubt that some kind of allograft or synthetic sling will replace the autologous fascial sling as the gold-standard treatment. This article provides an update on the surgical technique and long-term outcome of the full-length autologous rectus fascial sling in the treatment of women with sphincteric incontinence.

OPERATIVE TECHNIQUE

The procedure is performed in the dorsal lithotomy position. For most patients, a short (6–8 cm) transverse incision is made just above the pubis below the pubic hairline (**Fig. 1**). In obese patients, a larger incision may be necessary. The incision is carried down to the surface of the rectus fascia, which is dissected free of subcutaneous tissue. Two parallel horizontal incisions are made 2 cm apart in the midline of the rectus fascia about 2 cm above the pubis (**Fig. 2**). Using Mayo scissors, the incisions are extended superolaterally toward the iliac crest following the direction of the fascial fibers. The wound edges are retracted laterally on either side to permit a sling of about 16 cm to be obtained. The undersurface of the fascia is freed from muscle and scar, and each end of the fascia is secured with a 2:0 permanent monofilament suture using a running horizontal mattress placed at right angles to the direction of the fascial fibers (**Fig. 3**). The

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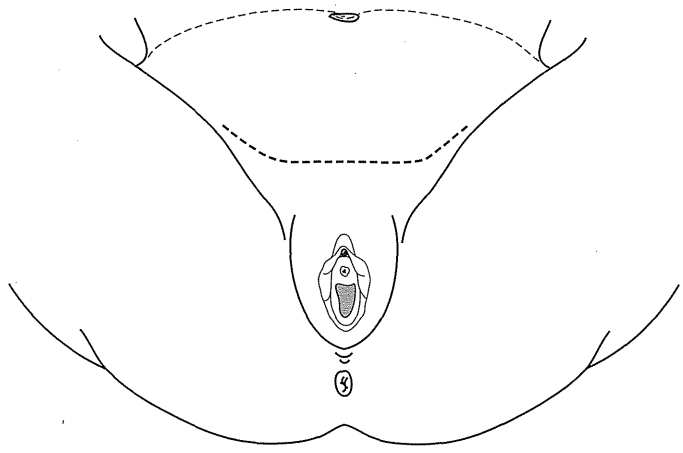

Fig. 1. Abdominal incision. For most patients, a short (6–8 cm) transverse incision is made just above the pubis below the pubic hairline. In obese patients, a larger incision may be necessary.

fascial strip is excised (**Fig. 4**) and placed in a basin of saline. The wound is packed temporarily with saline-soaked sponges, and attention is turned to the vagina.

A weighted vaginal retractor is placed in the vagina, and a Foley catheter is inserted into the urethra. The labia are retracted with sutures. The vesical neck is identified by placing gentle traction on the Foley catheter and palpating the balloon, and a gently curved horizontal incision is made in the anterior vaginal wall. The apex of the curve is over the vesical neck and about 2 cm proximal to the palpable distal edge of the balloon (**Fig. 5**). This incision should be made superficial to the pubocervical fascia. To accomplish this task, an Allis clamp is placed on the cranial edge of the vaginal incision in the midline. The clamp is grasped by the surgeon's left hand, and caudad traction is applied while the left index finger pushes upward (**Fig. 6**). A plane is created that is superficial to the pubocervical fascia through dissection with Metzenbaum scissors at an angle of 60° to 90° to the undersurface of the vaginal incision. The proper plane is identified by noting the characteristic shiny white appearance of the undersurface of the anterior vaginal wall. A small posterior vaginal flap is made for a distance of about 2 cm, just wide enough to accept the sling **Fig. 7** depicts the anatomic relationships between the vaginal wall, pubocervical fascia, and lower urinary tract.

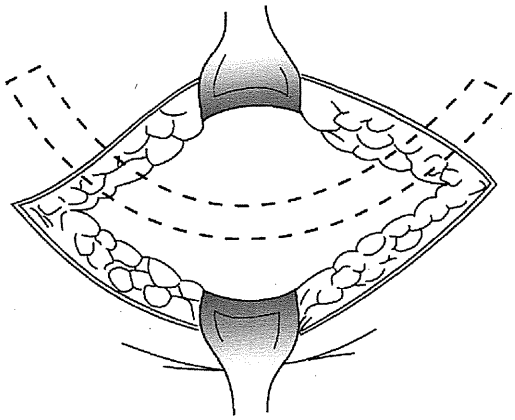

Fig. 2. A 2-cm graft is outlined, keeping the incision parallel to the direction of the fascial fibers.

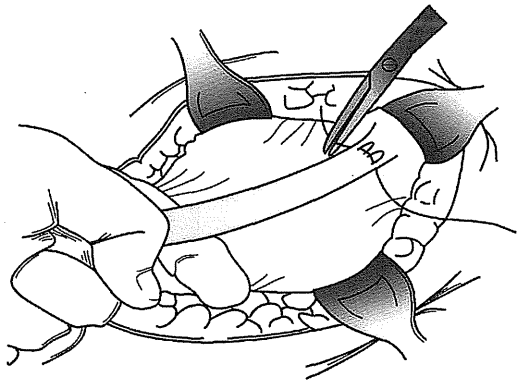

Fig. 3. A plane is created between the fascia and rectus muscle with Mayo scissors, and an index finger places traction on the fascia as the incision is extended superolaterally to the point where the rectus fascia divides to pass around the external oblique muscle. If further length is needed, the incision is extended superiorly. At this point, it is important to avoid the underlying peritoneum. A 2:0 nonabsorbable running horizontal mattress suture is placed across the most lateral portion of the graft. The ends are left long.

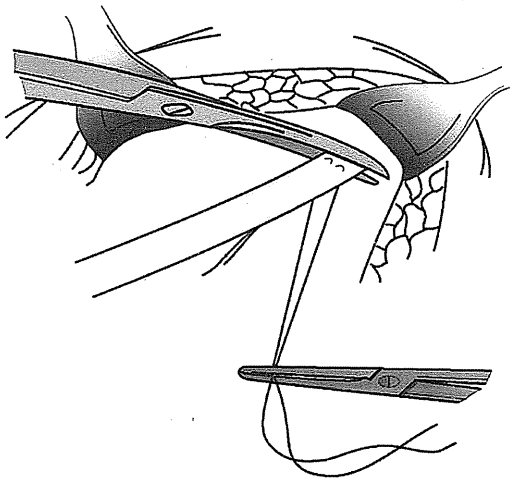

Fig. 4. Each end of the fascial graft is transected approximately 0.5 cm lateral to the mattress suture.

The lateral edges of the wound are grasped with Allis clamps and retracted laterally. The dissection continues just beneath the vaginal epithelium, and Metzenbaum scissors are pointed in the direction of the patient's ipsilateral shoulder (**Fig. 8**) using the index finger (**Fig. 9**) until the periostium of the pubis is palpable. During this part of the dissection, it is important to stay as far lateral as possible to insure that the urethra, bladder, and ureters are

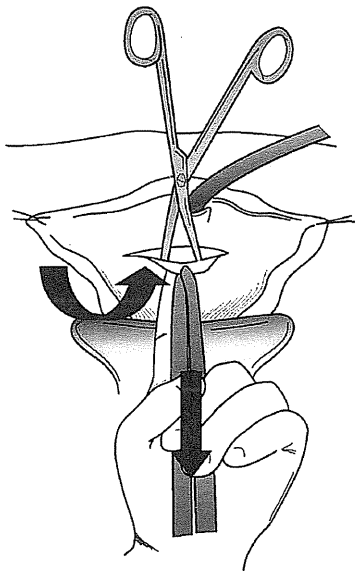

Fig. 6. An Allis clamp is placed on the cranial edge of the vaginal incision in the midline. The clamp is grasped by the surgeon's left hand of the surgeon, and caudad traction is applied while the left index finger pushes upward. A plane is created superficial to the pubocervical fascia by dissecting with Metzenbaum scissors at an angle of 60° to 90° to the undersurface of the vaginal incision. The proper plane is identified by noting the characteristic shiny white appearance of the undersurface of the anterior vaginal wall. A small posterior vaginal flap is made for a distance of about 2 cm, just wide enough to accept the sling.

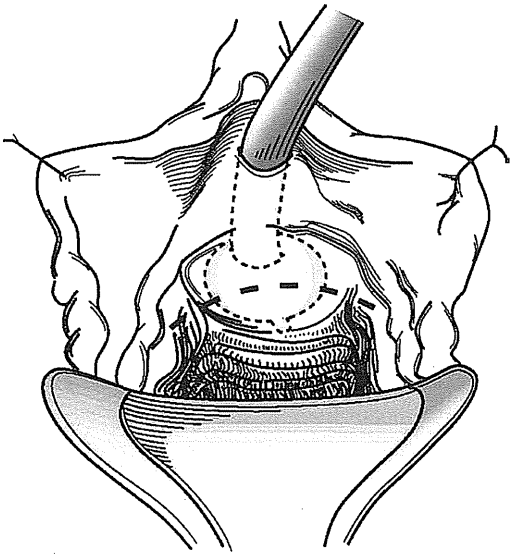

Fig. 5. A 4-cm transverse or slightly curved incision is made in the anterior vaginal wall about 2 cm proximal to the proximal edge of the Foley catheter balloon. This area is the approximate site of the vesical neck. The depth of this incision extends just superficial to the pubocervical fascia.

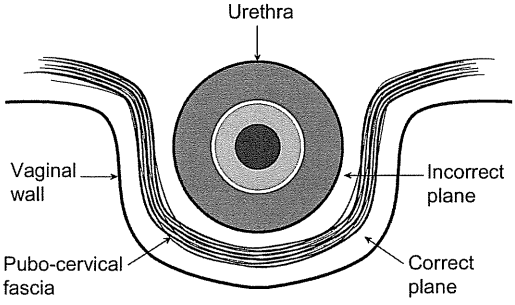

Fig. 7. The proper plane is superficial to the pubocervical fascia. The plane is apparent as the shiny white undersurface of the vaginal wall. If the incision is made deep to the pubocervical fascia, the dissection proceeds just underneath the urethra and bladder, exposing those structures to the possibility of injury. The wrong plane also has a shiny white surface, so great care must be exercised to ensure that the correct plane is identified.

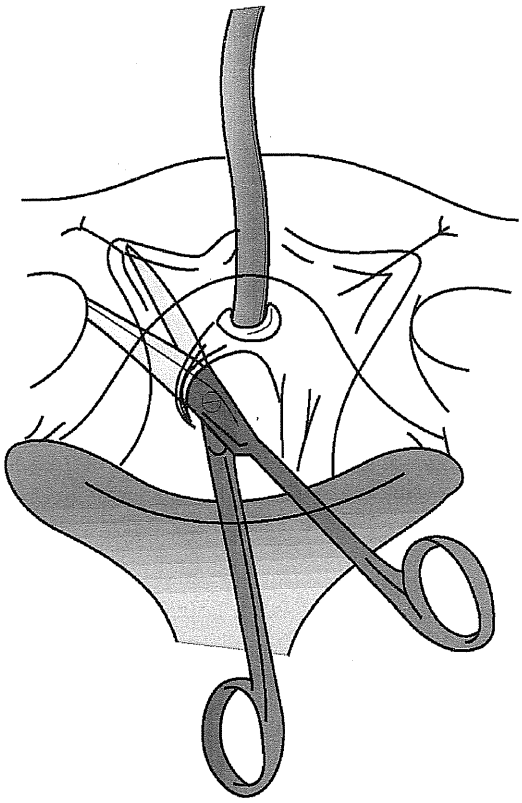

Fig. 8. The lateral edges of the wound are grasped with Allis clamps and retracted laterally (not pictured). The dissection continues just beneath the vaginal epithelium, and the Metzenbaum scissors are pointed in the direction of the patient's ipsilateral shoulder until the periostium of the pubis is palpable. During this part of the dissection, it is important to stay as far lateral as possible to ensure that the urethra, bladder, and ureters are not injured. This step is accomplished by pointing the concavity of the scissors laterally and by exerting constant lateral pressure with the tips of the scissors against the undersurface of the vaginal epithelium. Once the periostium is reached, the endopelvic fascia is perforated, and the retropubic space is entered.

not injured. This step is accomplished by pointing the concavity of the scissors laterally and by exerting constant lateral pressure with the tips of the scissors against the undersurface of the vaginal epithelium. Once the periostium is reached, the endopelvic fascia is perforated, and the retropubic space is entered. The bladder neck and proximal urethra bluntly are dissected free of their attachments to the vaginal and pelvic walls.

A Kocher clamp is placed on the inferior edge of the rectus fascia in the midline, and the fascia is pulled upward. The left index finger is reinserted into the vaginal wound, retracting the vesical

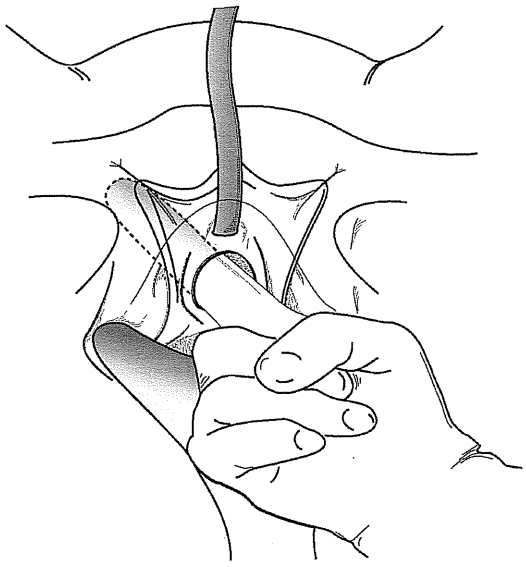

Fig. 9. The endopelvic fascia is perforated with the index finger, and the retropubic space is entered. The bladder neck and proximal urethra bluntly are dissected free of their attachments to the vaginal and pelvic walls.

neck and bladder medially. The tip of the finger palpates the right index finger, which is inserted just beneath the inferior leaf of the rectus fascia and guided along the undersurface of the pubis until it meets the left index finger from the vaginal wound (**Fig. 10**). A long curved clamp (DeBakey) is inserted into the incision and directed to the undersurface of the pubis. The tip of the clamp is pressed against the periostium and directed toward the left index finger, which retracts the vesical neck and bladder medially (**Fig. 11**). At all times, the left index finger is kept between the tip of the clamp and the bladder and urethra, protecting these structures from injury. In this fashion, the clamp is guided into the vaginal wound. When the tip of the clamp is visible in the vaginal wound, the long suture, which is attached to the fascial graft, is grasped and pulled into the abdominal wound (**Fig. 12**). The procedure is repeated on the other side.

Two small stab wounds are made in the rectus fascia just above the pubis (**Fig. 13**), and the sling is brought through them on either side (**Fig. 14**). The fascial sling now is positioned from the abdominal wall on one side, around the undersurface of the vesical neck, and back to the abdominal wall on the other side.

Five milliliters of indigo carmen are given intravenously, and cystoscopy is performed to insure that there is no damage to the urethra, vesical neck, bladder, or ureters. The sling is put on

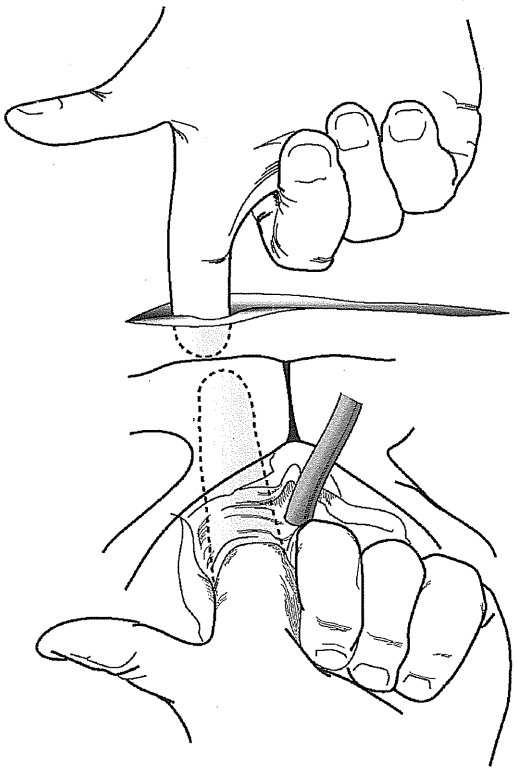

Fig. 10. A Kocher clamp is placed on the inferior edge of the rectus fascia in the midline, and the fascia is pulled upward (not pictured). The left index finger is reinserted into the vaginal wound, retracting the vesical neck and bladder medially. The tip of the finger palpates the right index finger, which is inserted just beneath the inferior leaf of the rectus fascia and guided along the undersurface of the pubis until it meets the left index finger from the vaginal wound.

tension by pulling up on the sutures, and the position of the sling is noted by observing where the urethra coapts. Historically, the sling has been placed intentionally at the bladder neck, and the authors continue to place it there; however, if cystoscopy shows that the sling is distal to the bladder neck, the authors do not attempt to reposition it. The results presented in this article are based on placement of the sling at the vesical neck rather than the midurethra. If cystoscopy shows that the sling inadvertently is placed proximal to the vesical neck, the sling is removed, and a new tunnel is created more distally. The authors generally place a trocar 14-Fr suprapubic tube percutaneously into the bladder, and its position visually is inspected to ensure that it is far away from the trigone. Although this step is not necessary in all patients, the authors find that it facilitates the postoperative voiding trial.

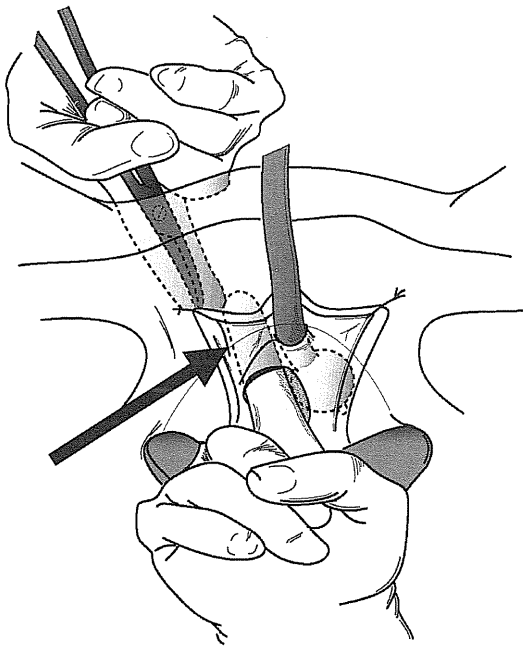

Fig. 11. A long curved clamp (DeBakey) is inserted into the incision and directed to the undersurface of the pubis. The tip of the clamp is pressed against the periostium and directed toward the left index finger, which retracts the vesical neck and bladder medially. At all times, the left index finger is kept between the tip of the clamp and the bladder and urethra, protecting these structures from injury. In this fashion, the clamp is guided into the vaginal wound.

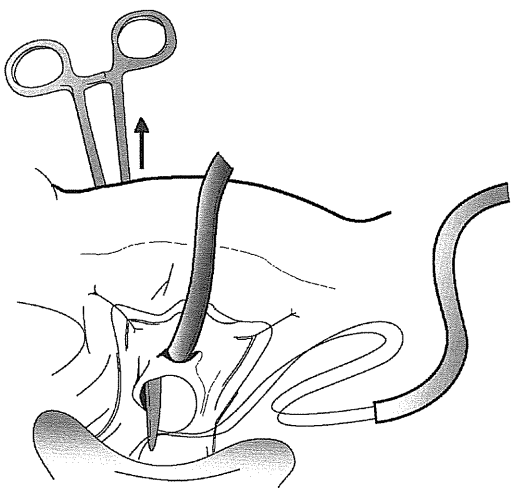

Fig. 12. When the tip of the clamp is visible in the vaginal wound, the long suture, which is attached to the fascial graft, is grasped and pulled into the abdominal wound. The procedure is repeated on the other side. The fascial sling now is positioned from the abdominal wall on one side, around the undersurface of the vesical neck, and back to the abdominal wall on the other side.

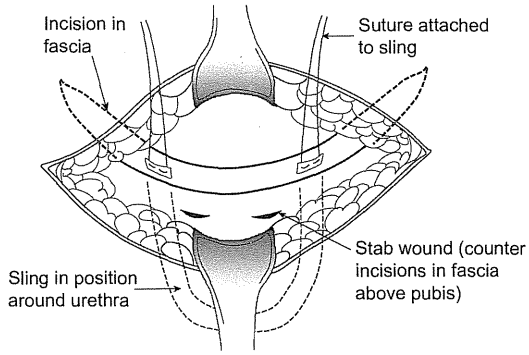

Fig. 13. Two small stab wounds are made in the rectus fascia just above the pubis.

The vaginal incision is closed with running sutures of 2:0 chromic catgut before securing the sling in place. The sutures that are attached to the sling are pulled through the separate stab wounds in the inferior leaf of the rectus fascia on either side (see **Fig. 14**), and the fascial defect is closed with a continuous 2:0 delayed absorbable monofilament suture. The long sutures that are attached to the ends of the fascial graft are tied to one another in the midline, securing the sling in place without any tension (**Fig. 15**).

To insure that excessive tension is not placed on the sling, the authors use several techniques. With the cystoscope in the bladder, the sutures on each end of the fascial strip are grasped and pulled gently upward while downward pressure

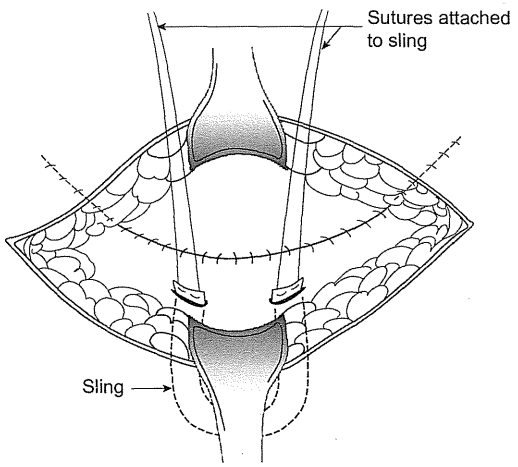

Fig. 14. The ends of the sutures that are attached to the sling are pulled through the stab wounds on either side, and the rectus fascia is closed with a 2:0 continuous delayed absorbable monofilament suture. The sutures that are attached to the ends of the fascial graft are tied to one another in the midline, securing the sling in place without tension.

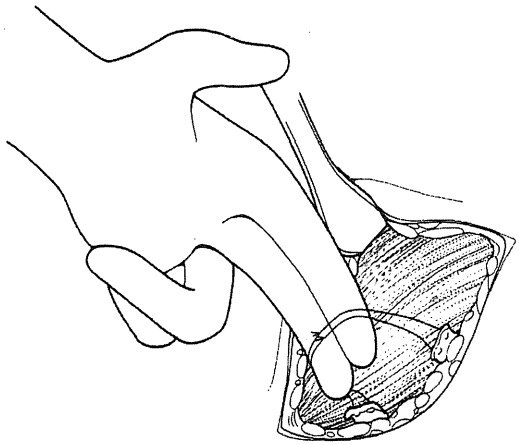

Fig. 15. The wound is closed.

is applied to the cystoscope. This approach depresses the vesical neck and puts the sling on stretch. The suture is released, removing excess tension from the sling. The cystoscope is removed, and a well-lubricated Q-tip is placed in the urethra. With the table placed exactly parallel to the floor, the urethral angle is measured. If the angle is negative, downward pressure is placed on the Q-tip at the bladder neck until the angle is 0° or greater. The sutures that are attached to the sling are tied over the rectus fascia with no added tension. It is usually possible to place two fingers comfortably between the sutures and the rectus fascia.

The completed procedure is depicted in **Fig. 16**. A vaginal pack is usually not left unless there has

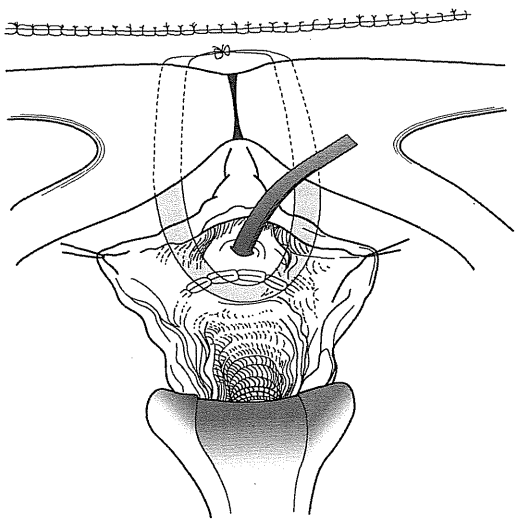

Fig. 16. The completed procedure. The sling is beneath the urethra, and each end is tied to the other over the rectus fascia.

been excessive bleeding. If one is used, it is soaked in sterile lubricating jelly to facilitate its painless removal after surgery.

POSTOPERATIVE MANAGEMENT

If a vaginal pack was used, it is removed the day after surgery. Voiding trials are begun as soon as the patient is comfortable, usually on the first or second postoperative day. If the patient is unable to void by the time of discharge, intermittent self-catheterization is taught.

More than 90% of patients void well enough by 1 week so that intermittent self-catheterization is not necessary, and more than 99% of patients are catheter free by 1 month. Permanent intermittent self-catheterization or urethral obstruction requiring surgery is necessary in less than 1% of patients.

RESULTS

The author's results have been published in four reports over the past 15 years and are summarized.[1–4] Since 1988, all women at our institution who undergo pubovaginal sling have been evaluated by structured history and physical examination, voiding diary, pad test, videourodynamics, and cystoscopy. After surgery, the diaries, pad tests, uroflow, and postvoid residual urine are repeated at each follow-up visit. Use of other outcome instruments, including questionnaires, symptoms scores, and patient-satisfaction indices, has been added over the years. According to the authors, the most accurate tool is the simplified urinary incontinence outcome score (SUIOS).[4] The SUIOS is comprised of three components: a 24-hour voiding diary, 24-hour pad test, and a patient outcome questionnaire, each of which has a range of scores from 0 to 2 points (**Table 1**). Cure (0 points) is defined as a patient's statement that she is cured, a dry pad test, and no incontinence episodes recorded in a voiding diary. Scores of 2 to 5 points are considered improvement, and a score of 6 points is failure (**Table 2**). For the purposes of outcome analysis, the authors divided patients into two groups: simple incontinence and complex incontinence. Complex incontinence was defined as sphincteric incontinence with at least one of the following conditions: urge incontinence, pipe stem urethra (a fixed scarred urethra), urethral or vesicovaginal fistula, urethral diverticulum, grade 3 or 4 cystocele, and neurogenic bladder. In the absence of these conditions, incontinence was considered to be simple.

Overall, the cure–improve rate and fail rate for 325 patients were 93% and 7%, respectively (mean follow-up, 4 years) (**Table 3**). For a subset of 67 patients with uncomplicated incontinence, the cure–improve rate was 100% (**Table 4**). Patients with scores of 5 or 6 points might have been considered to be failures; however, they were considered to have improved because, according to a validated instrument, the patients believed that they had improved despite persistence incontinence. In a separate analysis of 98 women, similar cure–improve and fail rates were found among with stress incontinence and women with mixed incontinence (97% vs 93%,

Table 1
Urinary incontinence survey instruments

Score	0	1	2
24-h diary, Incontinence episodes	0	1–2	≥3
24-h pad test, Weight gain (g)	≤8	9–20	≥21
Patient questionnaire (subjective assessment)	Cure	Improve	Fail

Adapted from Groutz A, Blavias JG, Rosenthal JE. A simplified urinary incontinence score for the evaluation of treatment outcomes. Neurouro Urodyn 2000;19:127–35.

Table 2
Simplified urinary incontinence outcome score (SUIOS)

Outcome	Total Score
Cure	0
Good response	1–2
Fair response	3–4
Poor response	5
Failure	6

Table 3
SUIOS after pubovaginal sling procedure for simple and complex sphincteric urinary incontinence

Outcome	Total Score	Patients (%)
Cure	0	45
Good response	1–2	27
Fair response	3–4	14
Poor response	5	7
Failure	6	7

Table 4
SUIOS after pubovaginal sling procedure for simple sphincteric urinary incontinence

Outcome	Total Score	Patients (%)
Cure	0	67
Good response	1–2	21
Fair response	3–4	9
Poor response	5	3
Failure	6	0

respectively; $P = 0.33$ using a SUIOS of 4 points as the cutoff between fail and cure or improvement).[3] In that study, patients also were divided into two groups: cured and not cured. Among the patients with mixed incontinence, there was no difference between the cured group and not-cured group with respect to age, surgery, menopausal status, bladder capacity, leak point pressure, pad weight, or type of overactive bladder. Patients who were not cured had more daily preoperative urgency episodes (5.6 vs 4.1 of cured patients) and urge incontinence episodes (5.1 vs 3), and they voided more frequently (12 vs 8 episodes). This finding suggests that the more severe the overactive bladder, the less likely the patient is to respond favorably to surgery.

In the author's combined series, most failures occurred within the first 6 months after surgery, and the most common cause of failure was persistent urge incontinence rather than stress incontinence. De novo urge incontinence occurred in about 3% of their series.

Over the years, significant complications have been uncommon. Only one patient died (an 80-year-old woman as a result of cardiac arrhythmia) in more than 500 patients (<0.2%). Each of the following complications occurred in only 1% of patients: wound infections, incisional hernia, and unexpected long-term urethral obstruction requiring surgery or intermittent catheterization. The authors could not identify any preoperative prognostic factors associated with urinary retention, in no small part because of the fact that it was so uncommon that it would take an enormous number of patients to power a study sufficiently to detect differences. Empirically, there were two causes: grade 3 and grade 4 pelvic organ prolapse, and placing the sling under too much tension. Adjusting tension comes in large part from experience; no long-term urethral obstruction that required surgery or long-term catheterization has occurred in the author's last 300 pubovaginal slings.

DISCUSSION

In a metanalysis of the peer-reviewed English literature, the American Urological Association (AUA) Female Stress Incontinence Clinical Guidelines Panel concluded that with short-term (1-year) and medium-term (4-year) success rates of more than 80%, pubovaginal sling and retropubic suspensions are the most efficacious procedures for treating stress incontinence.[5] Although there was insufficient data to look at subpopulations, it was believed that slings are likely to be more effective in treating intrinsic sphincter deficiency than in retropubic procedures.

In that same study, the investigators decried the paucity of scientifically valid outcome studies and recommended that better outcome instruments be developed and used in prospective trials. Since that report, a number of outcome instruments have been developed (including the SUIOS), and it is hoped that future studies will improve.

Many peer-reviewed studies have corroborated the panel's conclusions (albeit with the same scientific pitfalls) and have reported rates of persistent urge incontinence of 11% to 57% and de-novo urge incontinence rates of 0% to 30%.[1–4,6–17] Urethral obstruction requiring surgery or long-term intermittent catheterization was reported in 1% to 7% of cases. A new AUA guidelines panel is reviewing the literature, and its report is expected within the next few years.

Traditionally, patients have been classified on an anatomic basis (types 0–3) or a functional basis (urethral hypermobility or intrinsic sphincter deficiency), and the type of surgery has been based in part on the classification.[18] The authors no longer use these classification systems, but characterize the incontinence by two parameters: the leak point pressure and the degree of urethral mobility (Q-tip angle). No matter what the type, the authors and other investigators advocate use of the autologous fascial pubovaginal sling.[2,17–19]

SUMMARY

The autologous fascial pubovaginal sling remains the gold standard against which other surgeries for treating sphincteric incontinence should be compared. The authors have demonstrated that this procedure can be performed in a reproducible fashion with minimal morbidity. Using validated objective, semiobjective, and subjective outcome instruments, cure–improve rates of more than 90% have been documented. Urinary retention that occurs after the procedure should be minimal, as the sling is not tied with excessive tension. Persistent and de novo urge incontinence remain

vexing problems that the patient should be counseled about before surgery. Although the authors believe that in the future some form of synthetic or allograft sling will be shown to have equal or better efficacy and result in less morbidity, none has yet achieved that status.

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